Jun 27th, 2:10 PM - 2:30 PM

Concurrent Sessions C: A Comprehensive Approach to Fish Passage: What's Happening in Washington State - A Comprehensive Approach to Prioritizing and Developing Fish Passage Projects in Washington State

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A Comprehensive Approach to Prioritizing and Developing Fish Passage Projects in Washington State

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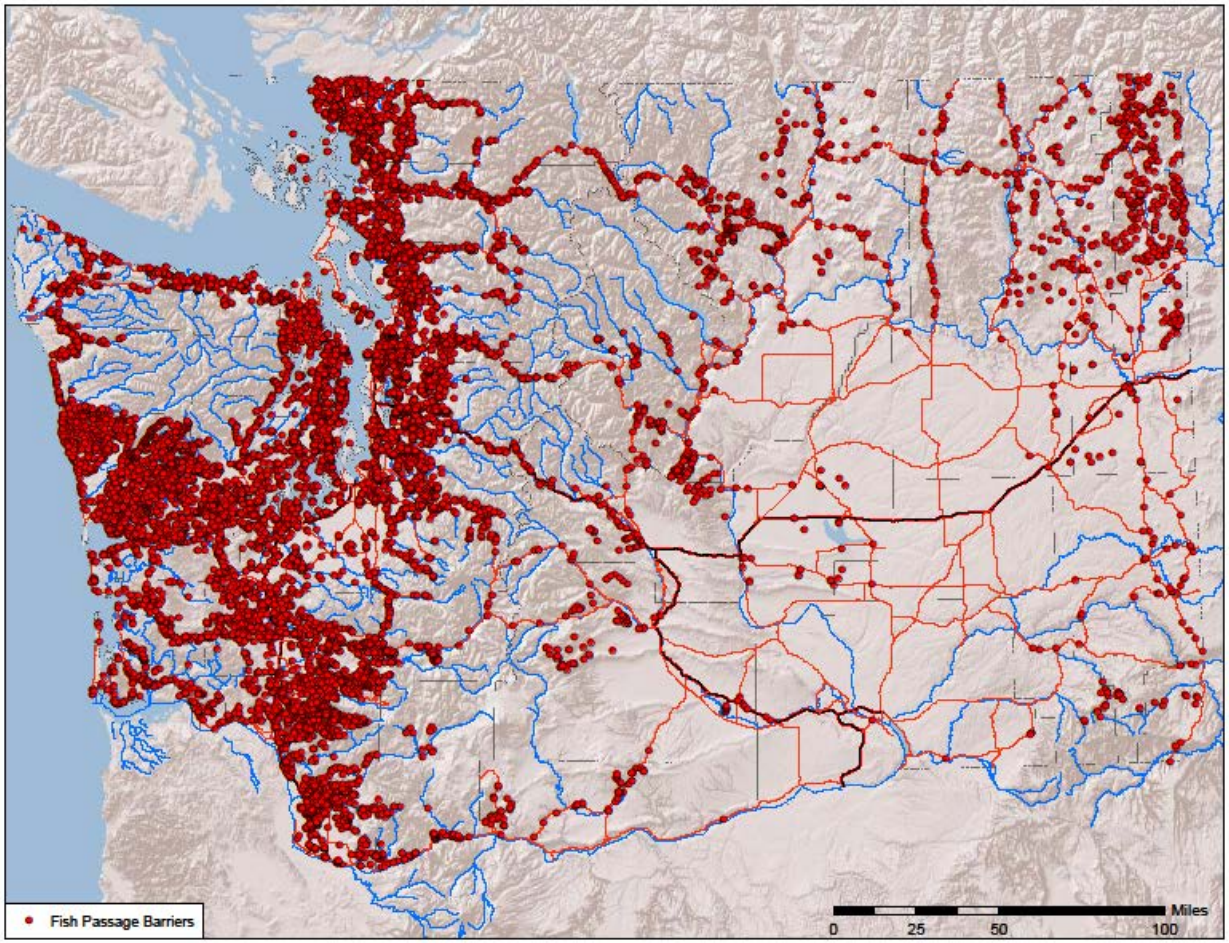
Scope of the problem…

Washington State has over 13,556 documented fish passage barriers on smaller streams. How do we choose the projects that we do?



Scope of the problem…

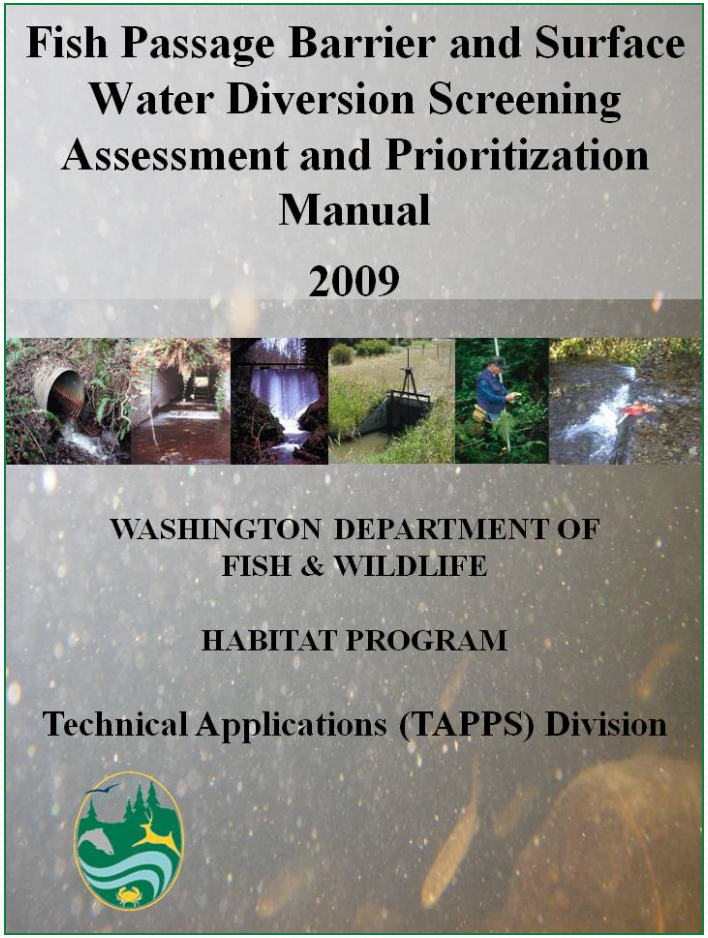
Prioritization

- Ensures that projects with the greatest benefits are constructed first
- More efficiently utilizes limited funds
- Helps identify projects when funding becomes available
- Could be advantageous when applying for grant funding

A brief history of WDFW barrier prioritization and project development methods.

- In 1991, WDF signed an agreement with WSDOT to assist them with assessment, prioritization, and conceptual design development.
  - Locate culverts on highways and evaluate passability
  - Determine salmon presence and fish access to the culvert
  - Measure habitat quality and quantity above the culvert
  - Provide an engineering evaluation of improvements needed for fish passage
    - Best approach to culvert repair
    - Estimate of the relative cost
    - Refine passability estimates
    - Create a list of feasible projects
- Within 1 year, the initial prioritization methodologies were developed.
- 22 years later, the scope of this project has set the framework for how barriers are assessed and prioritized throughout the state.

Standardized fish passage assessment and habitat survey methodologies.



- Methods developed in 1998 to support fish passage barrier prioritization
- Currently standardized protocols that are used throughout the state of Washington.
- Data is collected and entered into a Fish Passage Barrier Database by dedicated fish passage inventory staff.

Washington Department of Fish and Wildlife. 2009. **Fish Passage and Surface Water Diversion Screening Assessment and Prioritization Manual.** Washington Department of Fish and Wildlife. Olympia, Washington. http://wdfw.wa.gov/publications/pub.php?id=00061

The Priority Index

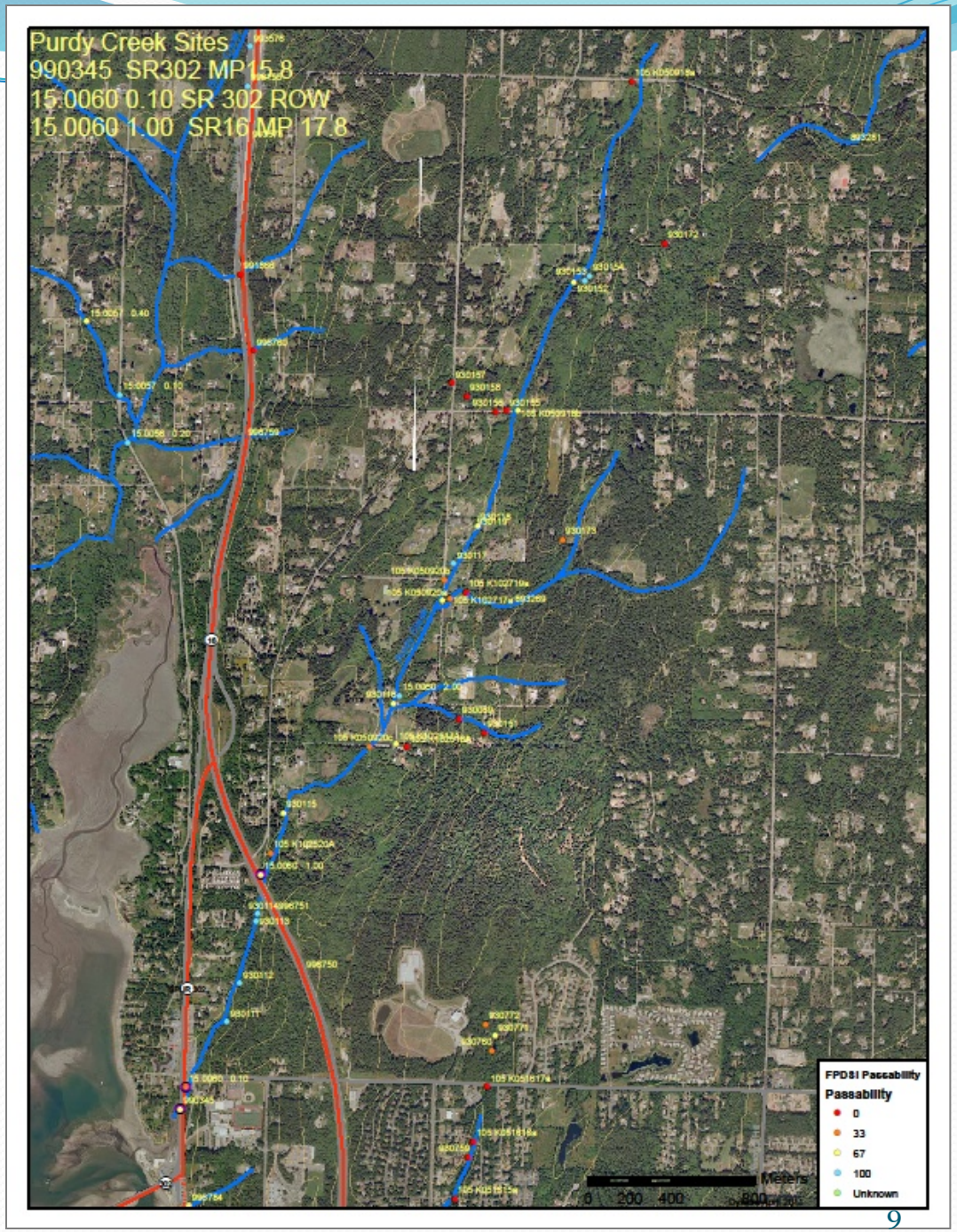
- Provides a numerical ranking system to prioritizing fish passage corrections that is a first cut for identifying projects.
- The index considers:
  - Potential improvement in fish passage
  - Species expected to benefit and their productivity
  - The quantity and quality of habitat upstream
  - Modified by the importance of the species in salmon recovery efforts and the cost of the project

The Priority Index (PI)

$$PI = \sum_{\text{all species}} \sqrt[4]{(BPH)MEC}$$

- Where:
- PI = Priority Index
- B = Passage improvement
- P = Annual adult production potential per m^2
- H = Habitat gain in m^2
- M = Mobility Modifier
- E = ESA Status Modifier
- C = Cost Modifier

Purdy Creek - An example

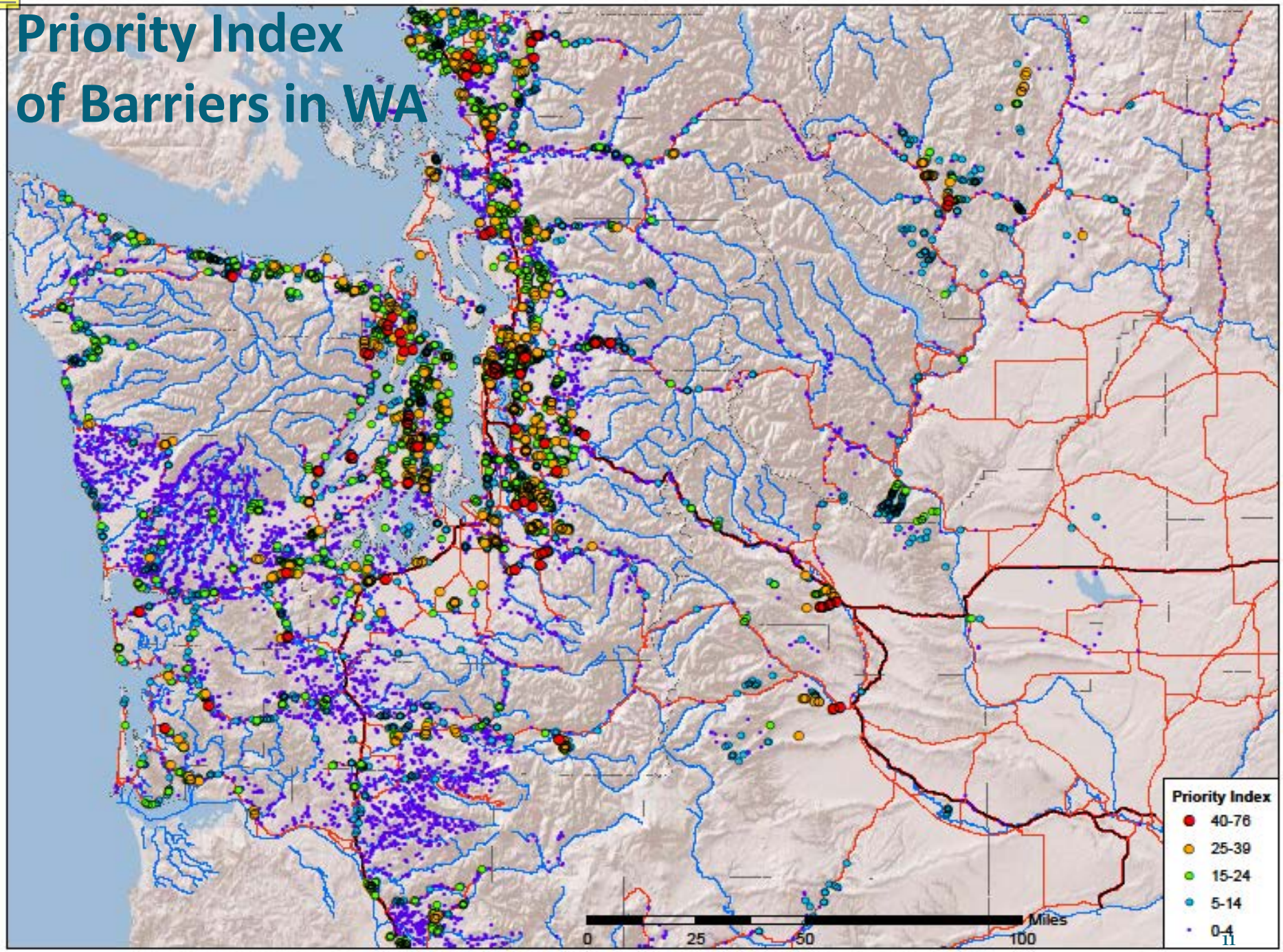


Purdy Creek – An example:

$$PI = \sum_{\text{all species}} \sqrt{(BPH)MEC}$$

Species	Proportion of Passage Improvement	Annual Adult Production Potential per m²	Habitat gain in m²	Mobility Modifier	ESA Status Modifier	Cost Modifier	Priority Index per species
	B	**P**	**H**	**M**	**E**	**C**	
Sockeye/Kokanee	**0.67**	3.0000	-	2	1	**1**	0.00
Chum	**0.67**	1.2500	8,045	2	1	**1**	10.77
Pink	**0.67**	1.2500	-	2	1	**1**	0.00
Coho	**0.67**	0.0500	17,960	2	2	**1**	7.00
Chinook	**0.67**	0.0160	3,931	2	3	**1**	3.99
Steelhead	**0.67**	0.0021	18,300	2	3	**1**	3.53
Sea-run Cutthroat	**0.67**	0.0370	18,300	2	1	**1**	5.49
Resident Trout	**0.67**	0.0400	20,996	1	1	**1**	4.87
Bull Trout	**0.67**	0.0007	-	1	1	**1**	0.00
						Total PI:	**35.65**

Priority Index of Barriers in WA

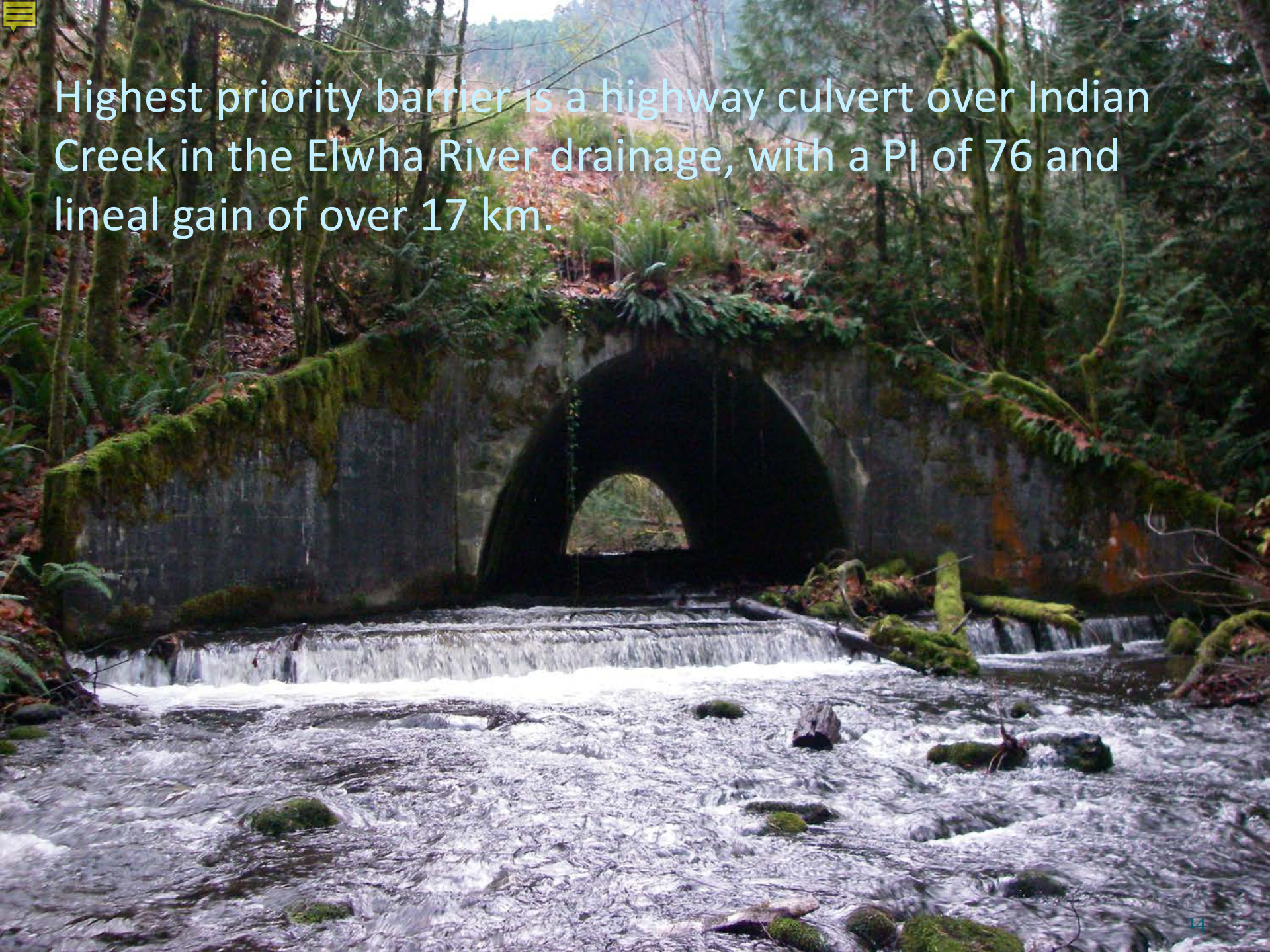


Limitations to the PI model

- Expensive and time consuming due to the need to walk the stream.
- Habitat surveys become outdated.
- Assumes all manmade barriers upstream are temporary such that it only considers potential habitat, which may not be immediately realized.
- Only calculated on streams that can be surveyed (walkable).
- Relies on estimated adult productivity, which is biased towards highly productive species such as chum.
- Regionally biased towards areas with multiple anadromous species, such as coastal streams.
- Barriers are only identified based on jurisdictional investments.

Highest priority projects in the WDFW Fish Passage Database

PI	Stream	Tributary to	Feature	Passability	Lineal Gain	Spawning Area	Rearing Area	Owner
76	Indian Cr	Elwha R	Culvert	33	17,109	11,854	115,344	State
71	Big Soos Cr	Green R	Dam	0	130,439	192,677	735,357	State
71	Little Bear Cr	Sammamish R	Culvert	33	45,990	32,627	99,905	City
66	NF Nemah R	Willapa Bay	Dam	67	64,048	265,892	212,036	State
64	Minter Cr	Henderson Bay	Dam	67	36,061	36,373	104,400	State
63	May Cr	Wallace R	Other	33	12,256	18,343	41,864	State
60	Issaquah Cr	Lake Sammamish	Dam	67	86,501	117,152	296,146	State
60	Big Quilcene R	Hood Canal	Dam	33	5,584	13,766	33,376	Federal
59	Little Bear Cr	Sammamish R	Culvert	67	45,736	32,022	98,633	City
59	Friday Cr	Samish R	Dam	67	66,239	69,569	282,460	State



Highest priority barrier is a highway culvert over Indian Creek in the Elwha River drainage, with a PI of 76 and lineal gain of over 17 km.

Other things to consider in project selection:

- Ownership
- Funding availability
- Limitations to repair
- Feasibility of the project realizing the estimated habitat gain
- Other restoration activities occurring within the basin
- Importance of the basin to salmon recovery

Fisher Creek fish passage barriers (assessed April 2008). These features are ranked by priority index.

Site ID	Feature	Barrier?	Passability (%)	PI	Stream	Trib To	Road	Owner Type	Lineal Gain	SpawnArea	Rear Area	US Barriers	Shape	Material	Span	Rise	Length	WS Drop
03.0181 0.50	Culvert	Yes	33	35.8	Fisher Cr	Carpenter Cr	I-5	State	27534	19626	52534	30	RND	SPS	2.44	2.44	105.50	0.00
CR196	Culvert	Yes	33	24.0	Starbird Cr	Fisher Cr		Private	9981	1663	16203	12	RND	PCC	0.91	0.91	9.00	0.00
CR195	Culvert	Yes	33	22.7	Starbird Cr	Fisher Cr	Starbird Cr Ln	Private	11479	2124	19443	14	RND	CST	0.91	0.91	10.10	0.20
999104	Culvert	Yes	33	22.6	Fisher Cr	Carpenter Cr		Private	8495	1761	12775	10	RND	SST	1.22	1.22	3.00	0.00
CR77	Culvert	Yes	67	19.1	Starbird Cr	Fisher Cr	Bulson Rd	County	11598	2366	19729	15	RND	PCC	1.52	1.52	22.10	0.00
CR199	Culvert	Yes	0	16.9	Starbird Cr	Fisher Cr		Private	483	0	2612	0	RND	CAL	0.91	0.91	7.00	0.00
CR88	Culvert	Yes	33	15.2	Trib G	Fisher Cr		Private	2722	178	2622	2	RND	CAL	1.07	1.07	5.00	0.00
999114	Culvert	Yes	33	14.8	Trib D5	Starbird Cr	Tyee Rd	County	364	0	3483	0	RND	PCC	0.38	0.38	10.10	0.00
999388	Culvert	Yes	67	14.2	Trib F	Fisher Cr		Private	1158	0	3937	1	RND	PCC	0.30	0.30	5.30	0.00
999766	Culvert	Yes	67	13.1	Trib F	Fisher Cr		Private	581	0	2830	0	RND	CST	0.30	0.30	7.40	0.00
03.0196 0.68	Culvert	Yes	0	12.4	Trib E	Fisher Cr	Pleasant Hill Rd	Private	880	75	772	0	RND	PCC	0.61	0.61	20.30	1.90
999054	Culvert	Yes	33	10.4	Trib C	Fisher Cr	driveway	Private	432	34	560	1	RND	PCC	0.30	0.30	10.70	0.07
999791	Dam	Yes	33	10.1	Trib D8	Starbird Cr		Private	144	0	495	0			0.00	0.00	0.00	0.00
999792	Culvert	Yes	33	10.0	Trib C	Fisher Cr		Private	206	23	485	0	RND	PCC	0.30	0.30	6.00	0.19
03.0196 0.10	Culvert	Yes	67	9.8	Trib E	Fisher Cr	Pleasant Hill Rd	County	1830	219	1402	1	RND	CMP	1.83	1.22	12.40	0.00
03.0181 5.76	Culvert	Yes	33	8.8	Fisher Cr	Carpenter Cr	English Grade Rd	County	509	58	490	2	RND	CST	0.46	0.46	11.60	0.61
CR80	Culvert	Yes	0	8.8	Trib D3	unnamed	Starbird Rd	County	359	88	313	0	RND	PCC	0.61	0.61	43.60	0.46
999106	collapsed	Unk	Unknown	8.4	Fisher Cr	Carpenter Cr		Private	164	4	245	0						
999107	Culvert	Yes	33	8.4	Fisher Cr	Carpenter Cr		Private	164	4	245	0	BOX	CPC	0.41	0.41	9.50	0.00
999772	Culvert	Yes	67	8.4	Trib D1	Starbird Cr		Private	613	4	482	0	RND	PVC	0.61	0.61	6.50	0.05
999387	wood flume	Yes	33	7.9	Trib D2	Starbird Cr		Private	563	21	386	3			0.00	0.00	0.00	0.35
CR85	Culvert	Yes	33	7.6	Trib D2a	unnamed	English Grade Rd	County	228	0	235	0	RND	PCC	0.46	0.46	25.10	0.00
999382	Culvert	Yes	33	7.3	Trib D2a	unnamed		Private	368	3	281	1	RND	CST	0.46	0.46	7.60	0.00
CR202	Culvert	Yes	67	6.8	Trib D2	Starbird Cr	Starbrook Ln	Private	950	63	655	4	RND	CST	0.91	0.91	11.80	0.00
999768	Culvert	Yes	33	6.8	Trib G3	unnamed	316th St NW	County	268	74	189	0	RND	PCC	0.30	0.30	12.10	0.00
999110	Culvert	Yes	0	5.9	Trib D6	Starbird Cr		Private	65	1	40	0	RND	CST	0.31	0.31	6.50	1.12
999115	Culvert	Yes	0	5.5	Trib D4	Starbird Cr	Bulson Rd	County	156	0	44	1	RND	PCC	0.46	0.46	13.50	0.48
999116	Culvert	Yes	67	5.3	Trib D4	Starbird Cr		Private	269	12	79	2	RND	PCC	0.30	0.30	6.00	0.05
999386	Culvert	Yes	33	4.1	Trib D4	Starbird Cr	Driveway	County	69	0	14	0	RND	PVC	0.30	0.30	9.00	
999767	Culvert	Yes	67	3.2	Trib G4	unnamed	English Grade Rd	County	46	0	16	0	RND	CST	0.30	0.30	11.40	0.00
CR86	Culvert	Yes	0	2.5	Trib D2	Starbird Cr	English Grade Rd	County	32	12	22	0	RND	PCC	0.46	0.46	13.20	0.00

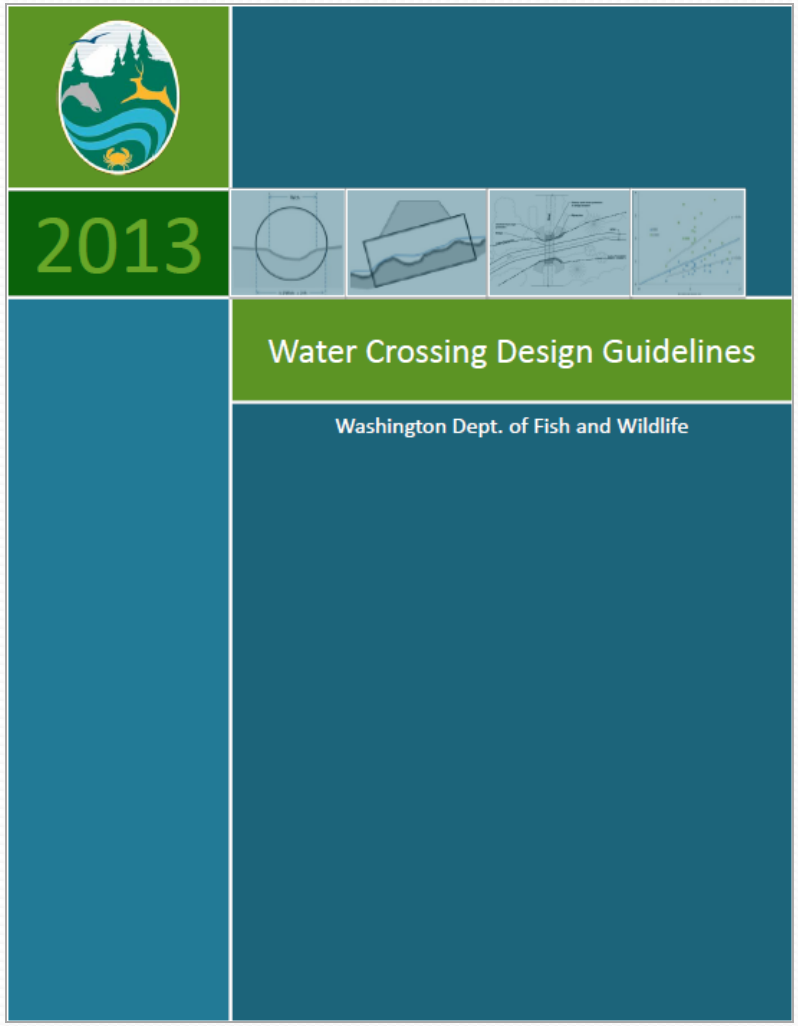
Project Scoping

- Verify habitat quality and species
- Identify constraints to project repair
- Identify opportunities to address more than just fish passage at the site.
- Work with other stakeholders to begin the coordination process
- Work with an engineer to develop conceptual design options

Terrell Creek barrier culvert repaired 2011.

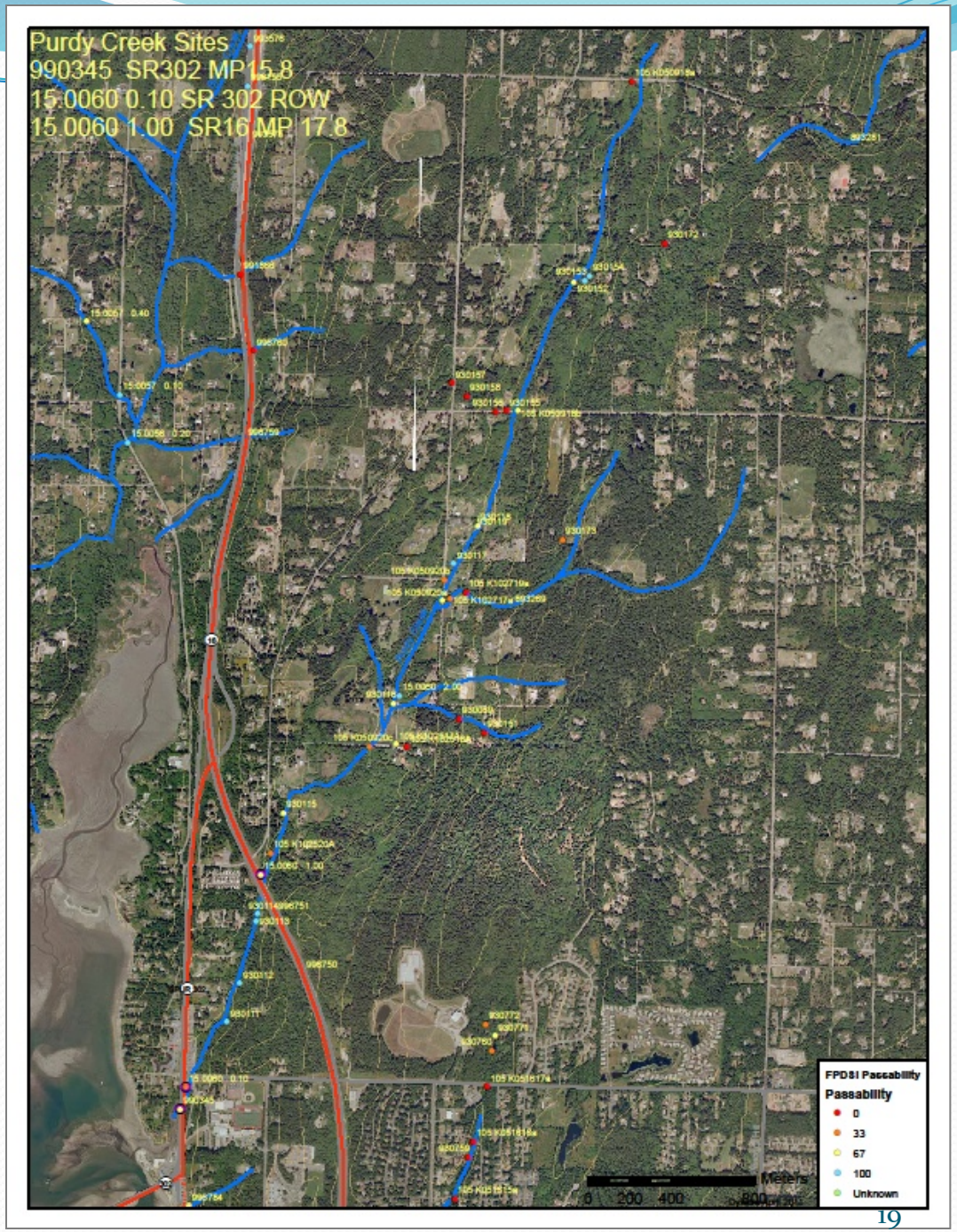
Standardized design guidelines for fish passage structures

- **Removal** – determine if structure is actually needed
- **Bridge** – channel-spanning bridges facilitate natural in-stream processes and habitat connectivity for fish and wildlife
- **Stream simulation culvert** – culvert wider than and placed at the same gradient as the stream channel and includes a bed throughout to mimic natural in-stream processes.
- **No-slope culvert** – small culvert set at a flat gradient used for simple installations.
- **Retrofit or fishway** – Used only for situations where other options are not feasible.



Barnard, R. J., J. Johnson, P. Brooks, K. M. Bates, B. Heiner, J. P. Klavas, D.C. Ponder, P.D. Smith, and P. D. Powers (2013), **Water Crossings Design Guidelines,** Washington Department of Fish and Wildlife, Olympia, Washington. **http://wdfw.wa.gov/hab/ahg/culverts.htm**

Purdy Creek - An example



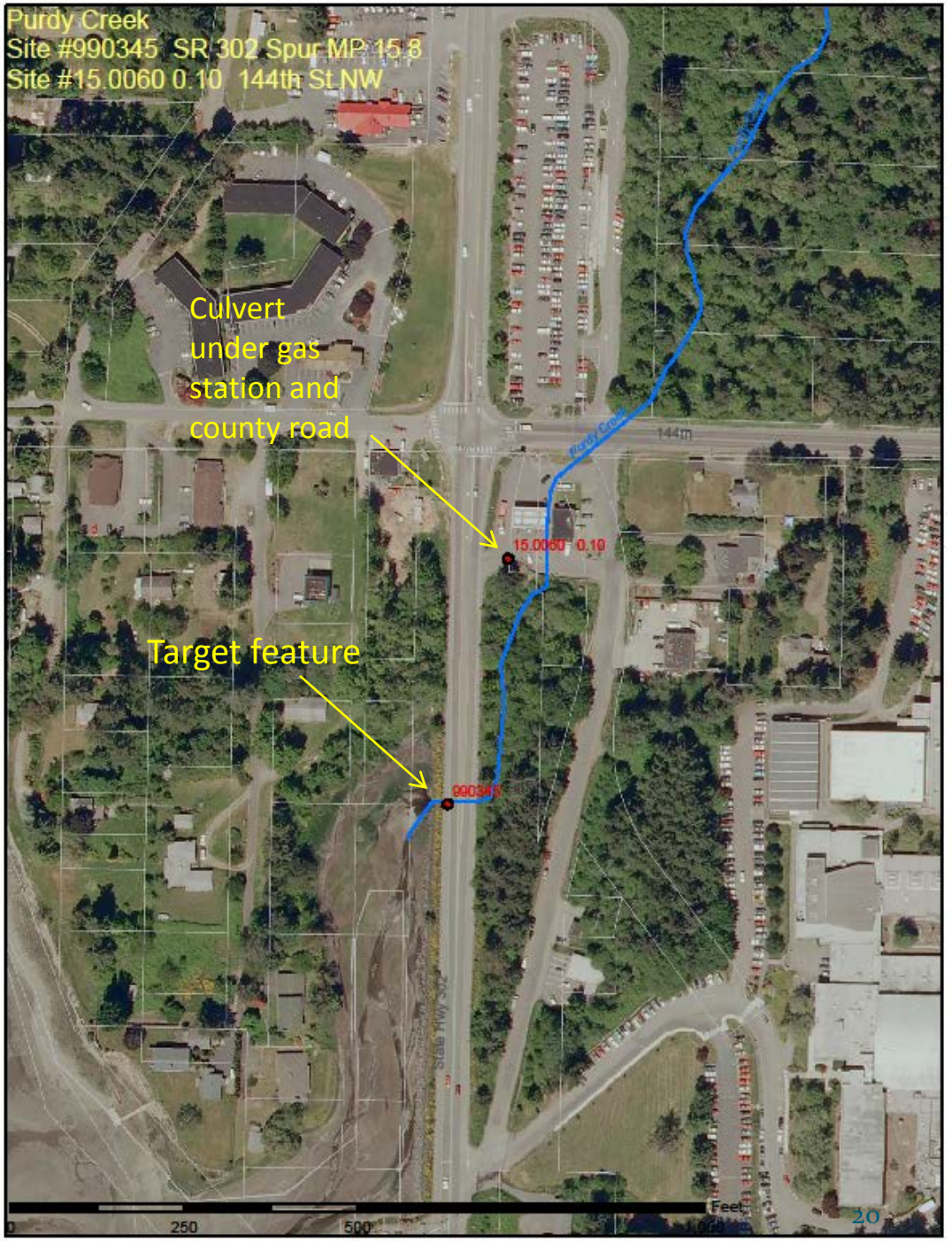
Purdy Creek – Project Scoping

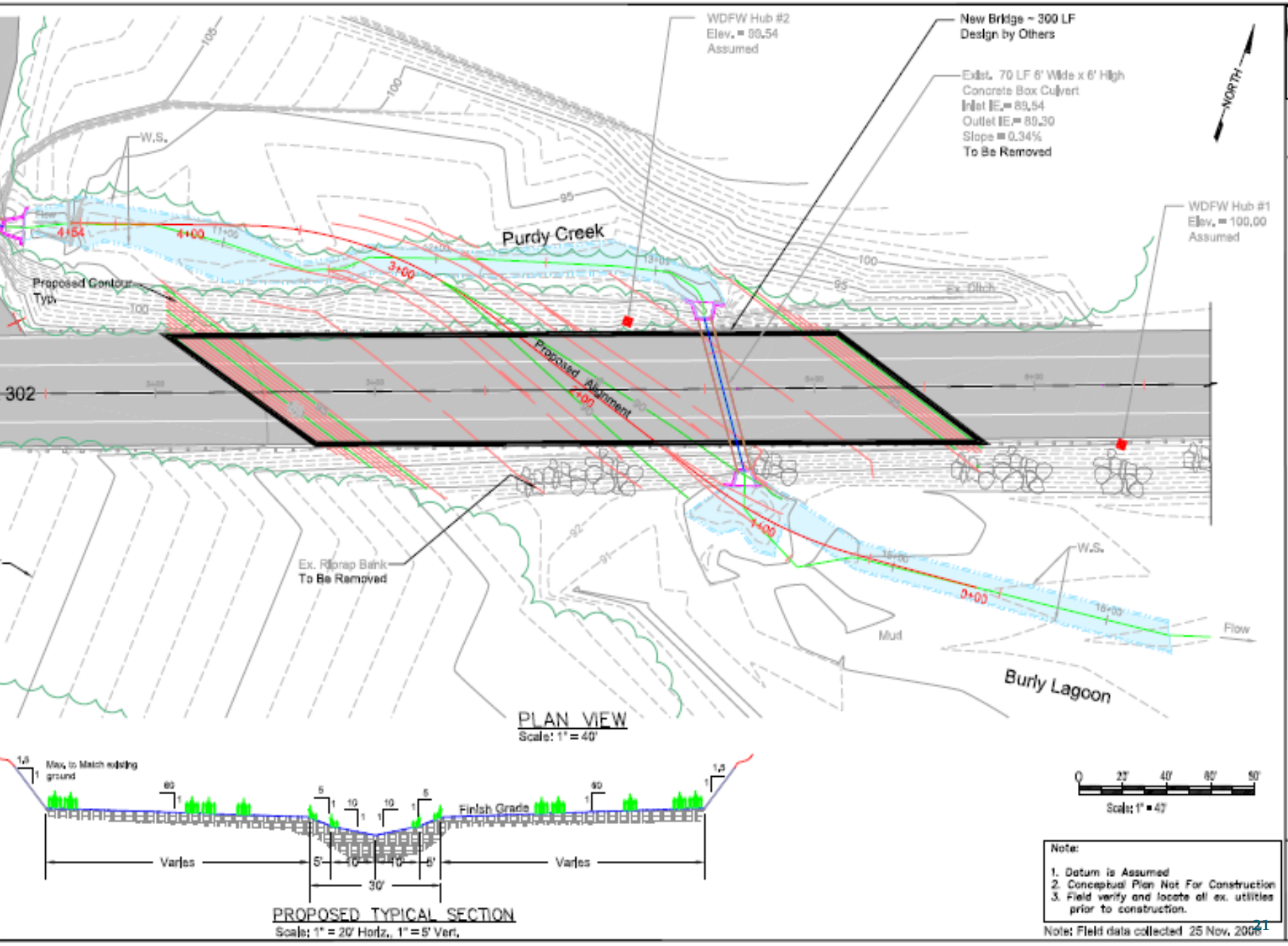
Constraints:

- Very long barrier culvert located 100m upstream of the crossing under gas station and county road.
- Located near a busy intersection
- Potential contamination of soils.
- Tidal influence – road is on fill at the outlet of Purdy Creek

Opportunities:

- Coordinate with the county and gas station owner to address the upstream barrier simultaneously
- Potential to remove fill, construct a long bridge, and restore some tidal processes.
- Two recent barrier repairs upstream, and another recently scoped for repair.
- Stream has a high production potential.




WDFW Hub #2
Elev. = 99.54
Assumed
New Bridge ~ 300 LF
Design by Others
Exist. 70 LF 6' Wide x 6' High
Concrete Box Culvert
Inlet IE.= 89.54
Outlet IE.= 89.30
Slope = 0.34%
To Be Removed
NORTH
WDFW Hub #1
Elev. = 100.00
Assumed
W.S.
Purdy Creek
Proposed Contour
Typ.
Ex. Ditch
Proposed Alignment
302
Ex. Riprap Bank
To Be Removed
W.S.
Mud
Flow
Burly Lagoon
PLAN VIEW
Scale: 1" = 40'
Max. to Match existing ground
Finish Grade
Varies
Varies
5'
10'
10'
5'
30'
PROPOSED TYPICAL SECTION
Scale: 1" = 20' Horiz., 1" = 5' Vert.
0
20'
40'
80'
80'
Scale: 1" = 40'
Note:
1. Datum is Assumed
2. Conceptual Plan Not For Construction
3. Field verify and locate all ex. utilities prior to construction.
Note: Field data collected 25 Nov. 2008
Engineer P. Smith
Subject: Conceptual Plan
Drawn by: K. Corwin
Site ID: 000345
Sheet 4 of 9

Questions?

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